# SECTION 5 – EAR, NOSE, THROAT

**Specific Conditions**

- Obstructive Sleep Apnea

**General Conditions**

- Hearing Injuries; Noise-Induced
  - *Army Institute of Public Health Case Definition*

# OBSTRUCTIVE SLEEP APNEA

## Background

This case definition was developed by the Armed Forces Health Surveillance Center (AFHSC) for the purpose of epidemiological surveillance of a condition important to military-associated populations. In 2004, an analysis of Veterans Health Administration records revealed that approximately three percent of more than four million U.S. military veterans have a documented diagnosis of sleep apnea;[1] the veterans included in this study were significantly older and contained proportionally more males than the current active military population.

## Clinical Description

Obstructive sleep apnea (OSA) is characterized by the complete or near-complete obstruction of the upper airway, usually at the level of the oropharynx. The resulting apnea leads to progressive asphyxia until there is a brief arousal from sleep, whereupon airway patency is restored and airflow resumes. The patient then returns to sleep, and the sequence of events is repeated often up to 400-500 times per night, resulting in marked fragmentation of sleep. The condition is more common in men, with symptoms that include snoring, choking, gasping during sleep, insomnia, morning headache, and daytime sleepiness.[2] Treatment depends on the severity of OSA and may include weight reduction, alcohol avoidance, intraoral appliances, surgery and continuous positive airway pressure (CPAP) during sleep.[3]

## Case Definition and Incidence Rules

For surveillance purposes, a case of obstructive sleep apnea is defined as:

- *One inpatient medical encounter* with any of the defining diagnoses of obstructive sleep apnea (see ICD9 code list below) in *any* diagnostic position; or
- *Two outpatient medical encounters*, within 90 days of each other, with any of the defining diagnoses of obstructive sleep apnea (see ICD9 code list below) in *any* diagnostic position.

***Incidence rules:***

For individuals who meet the case definition:

- The incidence date is considered the date of the first inpatient or outpatient medical encounter that includes a defining diagnosis of obstructive sleep apnea.
- An individual is considered an incident case only *once per lifetime*.

***Exclusions:***

- None

[1] Sharafkhaneh A, Richardson P, Hirshkowitz M. Sleep apnea in a high risk population: a study of the Veterans Health Administration beneficiaries. *Sleep Med*. 2004; 5(4): 345-350.
[2] Caples SM, Gami AS, Somers VK. Obstructive Sleep Apnea. *Ann Intern Med*. 2004; 142(3): 187-197.
[3] Braunwald, E., Fauci, A., Longo, D. et al. 2008. *Harrison's Principles of Internal Medicine*. 17th ed. United States: McGraw-Hill Professional.

## Codes

The following ICD9 codes are included in the case definition:

| Condition | ICD-9-CM Codes | CPT Codes |
|---|---|---|
| Obstructive sleep apnea | 780.51 (insomnia with sleep apnea, unspecified)<br>780.53 (hypersomnia with sleep apnea, unspecified)<br>780.57 (unspecified sleep apnea)<br>327.23 (obstructive sleep apnea, adult, pediatric) | NA |

## Development and Revisions

The case definition for obstructive sleep apnea was developed based on reviews of the ICD9 codes, the scientific literature, and previous AFHSC analyses. The case definition was developed by the AFHSC MSMR staff for a May 2010 MSMR article.[4]

*Case Definition and Incidence Rule Rationale*

- The interval of 90 days between outpatient visits is used to increase the sensitivity of the case definition and to allow for the time needed to make an accurate diagnosis of OSA. Diagnostic protocols for OSA often require various time intensive home sleep studies as well as overnight polysomnography at a sleep center.

## Reports

None

## Review

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|---|---|
| Dec 2011 | Case definition reviewed and adopted by the AFHSC Surveillance Methods and Standards (SMS) working group. |
| May 2010 | Case definition developed and reviewed by the AFHSC MSMR staff. |

## Comments

None

[4] Armed Forces Health Surveillance Center. Obstructive Sleep Apnea, Active Component, U.S. Armed Forces, January 2000-December 2009. *Medical Surveillance Monthly Report (MSMR)*; 2010 May; Vol 17(5): 8-11.

# HEARING INJURIES; NOISE-INDUCED

*Army Institute of Public Health Case Definition for AFHSC Noise Induced Hearing Injury (NIHI) Reports*

*Includes Tinnitus and Acoustic Trauma*

## Background

This case definition was developed by the Army Institute of Public Health (AIPH), in consultation with the DoD Hearing Conservation Working Group and the DoD VA Hearing Center of Excellence for the purpose of epidemiological surveillance of Noise-Induced Hearing Injuries (NIHI). The code set and groupings of hearing injury specific diagnoses used in this case definition are based on the collaborative efforts of DoD and Department of Veterans Affairs (VA) audiologists working together since 2002. [1,2] In 2010, in accordance with DoD Directive 6490-02E *Comprehensive Health Surveillance*[3], AIPH collaborated with the Armed Forces Health Surveillance Center to produce a series of reports on NIHI for the individual Services using this case definition and data stored in the Defense Medical Surveillance System.

Surveillance of NIHI in the military has been a long standing priority. In 2006, an Institute of Medicine (IOM) report estimated the prevalence of noise-induced hearing loss (NIHL) and tinnitus among U.S. military members from World War II through 2005. The report's authors concluded that military hearing conservation programs (HCPs) had not adequately protected the hearing of U.S. service members; they recommended using prospective, longitudinal, epidemiological data to reliably estimate the incidence, prevalence, and severity of NIHL and tinnitus in the U.S. Armed Forces.[4]

In response to the IOM report and to recent recommendations of the Government Accountability Office (GAO)[5], military audiologists and their Department of Veterans Affairs (VA) counterparts have worked to develop standardized outcome metrics for monitoring the effectiveness of HCPs. This collaboration produced a standard set of Department of Defense (DoD) ICD-9-CM coding guidelines designed to improve the quality of data used for reporting and tracking prevalence and incidence rates of noise-induced hearing injury (NIHI). [6] In January 2005, HCP coding guidelines were included in the Military Health System (MHS) coding manual. These guidelines include a minimal essential code set to define a significant threshold shift (STS) outcome from HCP monitoring audiometery.

## Clinical Description

The term "noise-induced hearing injuries" is used here to encompass a broad range of conditions that result in damage to the organ of hearing. These injuries and conditions are not hereditary or congenital; rather they are acquired through exposure to noise and often result in chronic hearing loss. A significant proportion of the hearing injuries sustained during military service are preventable.

[1] Helfer TM, Shields A, Gates KE. Outcomes analysis for hearing conservation programs. *Am J Audiol* 2000, 9: 75-83.
[2] Helfer T, Jordan N, Lee R, Pietrusiak P, et.al. Noise-induced hearing injury and comorbidities among postdeployment US Army soldiers, April 2003 through June 2009. *Am J Audiology.* 2011; 20:1-9.
[3] Directive can be accessed at: http://www.dtic.mil/whs/directives/corres/pdf/649002e.pdf
[4] Humes LE, Joellenbeck LM, Durch JS: Noise and military service: implications for hearing loss and tinnitus. Washington, DC: National Academy Press 2006.
[5] Government Accountability Office, 2011. GAO Report No. 11-114 Hearing loss prevention: improvement to DOD hearing conservation programs could lead to better outcomes.
[6] Helfer T, Canham-Chervak M, Canada S, Mitchener TA. 2008. Noise-induced hearing injury surveillance in the U.S. military, 2003-2005. In: Canham-Chervak M and B Jones, eds. Preventing injuries in the U.S. military: the process, priorities, and epidemiologic evidence. U.S. Army Center for Health Promotion and Preventive Medicine Technical Report No. 12-HF-04MT-08: 3-61-3-69.

Preventive measures include isolating sources of noise, controlling noise transmission, and the consistent wear of appropriate and properly fitted ear protection (e.g., earplugs, noise muffs, sound-attenuating helmets).[7]

The more widely used term "Noise-Induced Hearing Loss (NIHL)", referring to the condition of hearing loss caused by exposure to occupational and recreational noise, is similar to, though not synonymous with the term "Noise-Induced Hearing Injury" (see *Comments* section below).

**Case Definition and Incidence Rules**

For surveillance purposes, a case of noise induced hearing injury is defined as:

- *One inpatient or outpatient medical encounter* with any of the defining diagnoses of noise-induced hearing injury (see ICD9 code list below) in *any* diagnostic position.

***Incidence rules:***

For individuals who meet the case definition:

- The incidence date is considered the date of the first inpatient or outpatient medical encounter that includes a defining diagnosis of noise-induced hearing injury.
- An individual is considered an incident case only once per lifetime.
- *If analysis requires counts of individuals with an incident diagnosis in a specific hearing injury category*, an individual is allowed one incident event per category per lifetime.

***Exclusions:***

- None

**Codes**

The following ICD9 codes are included in the case definition for noise-induced hearing injury:

**Injury Category**

| Condition | ICD-9-CM Codes | CPT Codes |
|---|---|---|
| Sensorineural hearing loss | 389.10 (sensorineural hearing loss, unspecified)<br>389.11 (sensory hearing loss, bilateral)<br>389.15 (sensorineural hearing loss, unilateral)<br>389.16 (sensorineural hearing loss, asymmetrical)<br>389.17 (sensory hearing loss, unilateral)<br>389.18 (sensorineural hearing loss, bilateral) | NA |

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[7] Army Medical Surveillance Activity. Noise-induced Hearing Loss among Men, U.S. Armed Forces, 1998-1999. *Medical Surveillance Monthly Report (MSMR).* 2001 March; 7(3): 12-15.

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|---|---|---|
| Noise-induced hearing loss | 388.10 (noise effects on inner ear, unspecified)<br>388.11 (acoustic trauma, explosive, to ear)<br>388.12 (noise induced hearing loss) | |
| Significant threshold shift | 794.15 (nonspecific abnormal auditory function studies) | |
| Tinnitus | 388.30 (tinnitus, unspecified)<br>388.31 (subjective tinnitus)<br>388.32 (objective tinnitus) | |

**Development and Revisions**

This case definition was developed in October 2011 by the Army Institute of Public Health in consultation with the DoD Hearing Conservation Working Group and the DoD VA Hearing Center of Excellence. Military and Department of Veterans Affairs' audiologists with extensive clinical and population health surveillance experience, in collaboration with AFHSC staff, contributed to the development. The definition is used for annual and quarterly descriptive epidemiological reports on the frequencies and rates of NIHI and related injuries among U.S. active duty military personnel and was used for a Medical Surveillance Monthly Report (MSMR) article in June 2011.[8]

*Case Definition and Incidence Rule Rationale*

- The case definition and incidence rules may be modified to address unique questions being addressed by special analyses.

*Code Set Determination and Rationale*

- The code sets used for NIHI have evolved since 2002. The differences among the code sets found in the literature are a testimony to this evolution.[2-7] The original code sets were developed to capture medical encounters that could be used to routinely monitor HCP audiometry clinical outcomes. These code sets have been used in several epidemiological studies and peer-reviewed articles. [9, 10, 11]

- The code set and groupings of hearing injury specific diagnoses used in this case definition are a subset of the broader code set used as a "Watch List" for post deployment NIHI and comorbidities.[2]

[8] Armed Forces Health Surveillance Center. Noise-Induced Hearing Injuries, Active Component, U.S. Armed Forces, 2007-2010. *Medical Surveillance Monthly Report (MSMR).* 2011 June; 18(6): 7-10.
[9] Helfer T, Canham-Chervak M, Canada S, Mitchener TA. Epidemiology of hearing impairment and noise-induced hearing injury among US military personnel, 2003-2005. *Am J Prev Med*. 2010; 38(1S):S71-S77.
[10] Helfer T, Jordan N, Lee, R. Postdeployment hearing loss in U.S. Army soldiers seen at audiology clinics from April 1, 2003 through March 31, 2004. *Am J Audiology.* 2005; 14:161-168.
[11] Jordan N, Lee R, Helfer, T. Noise-induced hearing injury (NIHI) among Army active duty soldiers deployed to the central command area of operations (CENTCOM AOR). *Seminars in Hearing.* 2009; 30:28-37.

- The Watch List for post deployment NIHI and co-morbidities, first developed in 2007 by analysts at the US Army Center for Health Promotion and Preventive Medicine (USACHPPM), now the Army Institute of Public Health (AIPH), includes additional ICD9 codes for mild traumatic brain injury (mTBI), posttraumatic stress disorder (PTSD), speech-language pathologies, tympanic membrane perforations and other disorders of interest related to head trauma. [2]

- ICD9 codes for tinnitus are included in the code set because in a military occupational environment the condition is likely due to noise or blast exposure.[4] The tinnitus code group was also included to address recommendations from the IOM and GAO reports [3,4] and to provide data on the condition to the VA for hearing health service planning purposes.

- The ICD9 codes for ear drum perforation and mixed hearing loss listed below were included in the code table in the June 2011 MSMR article. These codes were used for additional analyses on blast-related comorbidities and are not part of this case definition.

  *Ear drum perforation*: ICD9 codes 384.20 (perforation of tympanic membrane unspecified), 384.20 (perforation of tympanic membrane unspecified), 384.21 (central perforation of tympanic membrane), 384.22 (attic perforation of tympanic membrane), 384.23 (other marginal perforation of tympanic membrane), 384.24 (multiple perforations of tympanic membrane), 384.25 (total perforation of tympanic membrane), 384.81 (atrophic flaccid tympanic membrane), 384.82 (atrophic nonflaccid tympanic membrane), 384.9 (unspecified disorder of tympanic membrane), 385.23 (discontinuity or disorder of ear ossicles).

  *Mixed hearing loss:* ICD9 codes 389.20 (mixed hearing loss, unspecified), 389.21 (mixed hearing loss, unilateral, 389.22 (mixed hearing loss, bilateral)

- The following procedure codes were included in the code table in the June 2011 MSMR article. These codes are used for additional analyses for the annual report only, are not part of this case definition, and are not used for regular MSMR reports: CPT codes: 92552 (pure tone audiometry (threshold) air only), 92555 (speech audiometry threshold), 92556 (speech audiometry threshold, with speech recognition), 92557 (comprehensive audiometry threshold evaluation and speech recognition), 92559 (audiometric testing of groups).

## Reports

AFHSC reports on noise-induced hearing injuries in the following reports:

- Periodic MSMR reports on Noise-Induced Hearing Injuries.
- Annual and Quarterly: detailed AFHSC DoD and Service-specific reports on NIHI for AIPH and other Services' surveillance hubs.

## Review

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| Oct 2012 | Case definition reviewed and adopted by the AFHSC Surveillance Methods and Standards (SMS) working group. |
| Mar 2010 | Case definition developed by the Army Institute of Public Health in collaboration with the DoD Hearing Conservation Working Group and the DoD VA Hearing Center of Excellence. |

**Comments**

*Noise-Induced Hearing Loss:* Noise-induced hearing loss is a sensorineural hearing deficit that begins at the higher frequencies (3,000 to 6,000 Hz) and develops gradually as a result of chronic exposure to excessive sound levels. Although the loss is typically symmetric, noise from sources such as firearms or sirens may produce an asymmetric loss. Exposure to potentially harmful sound levels may occur in the workplace[12], during recreational activities (e.g., snowmobiling, motorcycle riding) and during exposure to other nonoccupational sources of noise (e.g., chain saws, power tools, amplified music).[13] Clinically, NIHL begins with a temporary threshold shift (TTS) with the extent of the shift related to noise intensity, frequency, and temporality. Sound levels greater than 80dBA have potential to cause damage. High frequency noise is more damaging than low frequency noise and continuous noise is more damaging than intermittent.[14] Hearing loss due to noise can be temporary or permanent and may be associated with tinnitus (ringing in the ears).

[12] Occupational noise-induced hearing loss. ACOM Noise and Hearing Conservation Committee. *J Occup Med*. 1989; 31:996.
[13] Meyer-Bisch C. Epidemiological evaluation of hearing damage related to strongly amplified music (personal cassette players, discotheques, rock concerts): high definition audiometric survey on 1,364 subjects. *Audiology*. 1996; 35:121–42.
[14] Pourbakht A, Yamsoba T. Cochlear damage caused by continuous and intermittent noise exposure. *Hear Res*. Apr 2003: 1781 (1-2): 70-78.